



Image 2827 AF
Express Mail No. EV 313 842 586 US

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

Application of: Eng-Chew Cheach Confirmation No.: 1049
Serial No.: 09/863,652 Art Unit: 2827
Filed: May 22, 2001 Examiner: David A. Zarneke
For: Multi-Tiered Lead Package for an Attorney Docket No: 9818-050-999
Integrated Circuit

BRIEF ON APPEAL FEE TRANSMITTAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

An original and two copies of the applicant's Brief on Appeal in the above-entitled application are submitted herewith. The item(s) checked below apply:

- ☒ The Brief filing fee is \$330.00
☐ Applicant has qualified for the 50% reduction in fee for an independent inventor, nonprofit organization or small business concern and the Brief filing fee is \$165.00

The brief filing fee is:

- ☒ Required.
☐ Not required. (Fee paid in prior appeal.)

Please charge the required Brief filing fee to Pennie & Edmonds LLP Deposit Account No. 16-1150. A copy of this sheet is enclosed.

Respectfully submitted,

Date: December 29, 2003

Brett Lovejoy 42,813
Brett Lovejoy (Reg. No.)
For Francis E. Morris, Reg. No.
24,615
PENNIE & EDMONDS LLP
3300 Hillview Avenue
Palo Alto, California 94304
(650) 493-4935

Enclosure



U.S. Patent Application Serial No.: 09/863,652

Express Mail No. EV 313 842 586 US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of: Cheach, Eng-Chew

Confirmation No.: 1049

Serial No.: 09/863,652

Art Unit: 2827

Filed: May 22, 2001

Examiner: David A. Zarneke

For: *Multi-Tiered Lead Package for an
Integrated Circuit*

Attorney Docket No: 009818-0050-999

**BRIEF ON APPEAL BEFORE THE BOARD OF PATENT APPEALS AND
INTERFERENCES**

Commissioner for Patents
Mail Stop AF
P. O. Box 1450
Alexandria, VA 22313-1450

Sirs:

(1) Real Party in Interest

The real party in interest is Altera Corporation

(2) Related Appeals and Interferences

There are no related appeals or interferences.

(3) Status of Claims

Claims 1-13 and 20-27 are pending and appealed. Claims 14-19 are directed to a non-elected invention and have been cancelled without prejudice.

(4) Status of Amendments

On June 27, 2003, a response was filed to a final rejection. An Advisory Action mailed on July 25, 2003, states that proposed amendments in that response will be entered for purposes of appeal.

01/05/2004 JADD01 00000056 161150 09863652

01 FC:1402 330.00 DA

(5) Summary of the Invention

As semiconductor die sizes have become smaller, bond pad pitches have become smaller, bond wire-lengths have become longer, and bond wire diameters have become smaller. As a result, the bond wires are relatively flexible and prone to contact each other to form short circuits.

To prevent this from happening, the present invention provides an intermediate lead finger to which an intermediate portion of a bond wire is coupled (as in independent claim 1), or attached (as in independent claim 9), or affixed (as in independent claim 20). This structure is shown in Fig. 1A where a bond wire 140 is connected at one end to a package lead 150 and at the other end to a bond pad 135 while an intermediate portion is attached to an intermediate lead finger 125a. (See Specification at 4, lines 15-18.)

This structure is confirmed by the process diagram of Fig. 2 and the description thereof on page 5 of the Specification. There it is stated that the bond wires are attached to the bond pads of the semiconductor die at step 230 (lines 8-9), the bond wires are attached to the package leads at step 240 (line 10), and the intermediate portions of the bond wires are attached to the intermediate bond (sic: should read, "lead") fingers at step 250 (lines 11-12). Further it is noted at lines 14-17, that the intermediate portions of the bond wires are immobilized during subsequent manufacturing procedures by the intermediate bond (sic: lead) fingers.

As a result of this arrangement, each of the bond wires is effectively divided into two shorter portions. (See Specification at 4, lines 19-20.) And, because of their shorter length, these portions have greater structural integrity and are less likely to create a short with an adjacent bond wire, e.g., when molding material is poured over the package.

(6) Issues

The following issues are presented:

- a. Are claims 1-7 and 20-26 anticipated under 35 U.S.C. 102(e) by Tanaka et al. (U.S.P. 6,265,762)?
- b. Are claims 8 and 27 obvious under 36 U.S.C. 103(a) in view of Tanaka et al.?
- c. Are claims 9-13 obvious under 35 U.S.C., 103(a) over Lacap (U.S.P. 5,905,299) in view of Tanaka et al.?

(7) Grouping of Claims

No further grouping of claims is proposed.

(8) Argument

This appeal is narrowly focused on what is taught in Figs. 8-11 of Tanaka et al. Figs. 8 and 9 are sectional views of one embodiment and Figs. 10 and 11 are sectional views of a variation of the first embodiment. Figs. 8-11 are described at Col. 10, lines 23-67 of Tanaka et al.

Each of Figs. 8-11 shows a wire supporting portion 15. As shown in Figs. 9 and 11, a bonding wire 13 extends upward from a pad electrode 11 on a semiconductor chip 10, is bent downwards approximately 120°, appears to touch a corner of supporting portion 15, and ends at lead 4. Elements 10, 11 and 15 are not explicitly referred to by number in the description of Figs. 8-11 but they are referred to in the description of Fig. 4 at Col. 5, line 66 to Col. 6, line 1. At Col. 10, lines 31-36, the description of Fig. 8 states that the wire supporting portion 15 “is capable of supporting and maintaining a loop of wire bonded between the pad electrodes of the semiconductor chip and respective leads at a fixed height when the semiconductor device is assembled.” The Tanaka et al. specification goes on to state at Col. 10, lines 43-46 that “it is possible to maintain the loop height of the wire constant because a wire supporting portion 15 for supporting the bonding wire is provided. Thus, the possible occurrence of a short-circuit among mutual wires can be reduced.”

The difference between the variation of Figs. 10 and 11 and the embodiment of Figs. 8 and 9 lies in the mounting of supporting portion 15 on a jig 16 in the variation of Figs. 10 and 11. In the variation, the supporting portions 15 project through slits 17 in supporting body 8; and, as stated at Col. 10, lines 60-61 the supporting portions are retracted from the slits after wire bonding is completed. Since the supporting portions are retracted from the slits after wire bonding is completed, it is apparent that the bonding wires are not affixed or bonded in any way to the supporting portions and that the function of the supporting portions has been accomplished once the wire bonding is completed. As is made clear at Col. 10, line 35 and again at line 43, the function of the supporting portions 15 of Tanaka et al. is to maintain the bonding wires at a fixed or constant height.

a. Claims 1-7 and 20-26 are not anticipated under 35 U.S.C. 102(e)
by Tanaka et al.

To establish anticipation, each element of the claim must be disclosed in a single reference.

Applicant's independent claims 1 and 20 are directed to a semiconductor package having a semiconductor die with a bond pad, a package lead, a bond wire coupled at one end to the package lead and at the other end to the bond pad, and an intermediate lead finger. The intermediate lead finger is positioned between the package lead and the bond pad and is coupled (as in claim 1) or affixed (as in claim 20) to an intermediate portion of the bond wire. Further, the intermediate lead finger remains so coupled or affixed through a subsequent molding process.

Tanaka et al. does not describe a semiconductor package in which the bonding wire is coupled or affixed to an intermediate lead finger. Tanaka et al. clearly states at Col 10, lines 33-35 that the bonding wire is "bonded between the pad electrodes of the semiconductor chip and respective leads," conspicuously omitting any mention of any connection to the supporting portion 15. Moreover, the supporting portion 15 in the variation of Figs. 10 and 11 can be withdrawn from slits 17 after wire bonding is complete. If the bonding wires were connected to the supporting portions, withdrawal of portions 15 would also draw the bonding wires through the slits and thereby destroy the electrical connection between the bonding pads and the leads. Since such destruction is obviously not desired, it is clear that the supporting portions 15 are not connected to the bonding wires.

The Examiner concedes in the Advisory Action of July 25, 2003, that there is no explicit teaching in Tanaka of a connection between the supporting portions 15 and the bonding wires because he points to no such teaching. Instead, the Examiner argues that Tanaka's use of the word "maintaining" at Col 10, line 33 "does indeed *imply* some form of securement." (Emphasis supplied) Applicant respectfully disagrees with what in essence is an argument from inherency.

The Examiner relies on dictionary definitions that 'maintaining' means "to keep in an existing state" and "to defend or hold against criticism or attack" and argues that these can be interpreted to "include the concept of 'maintaining' against the flow of a molding resin." In making this argument, however, the Examiner overlooks both the clear statements in Tanaka et al. as to what is being supported and maintained and the absence of any discussion of the effects of flowing resin. At Col. 10, lines 33-35, Tanaka et al. clearly states that the supporting portion "is capable of supporting and maintaining a loop of wire . . . at a fixed height. This usage of the word "maintaining" has nothing to do with defending against criticism or attack. Moreover, in view of the statement at Col 10, lines 60-61 that the

supporting portions are retracted from slits 17 after wire bonding is completed, it appears that “maintaining” as used in Tanaka et al. does not even have the meaning of “keep in an existing state.”

Most importantly, the fact that the supporting portions 15 are clearly not connected to the bonding wires in the variation of Figs. 10 and 11, but do achieve the function of stabilizing bonding (Col. 10, line 65) makes it apparent that the goals of Tanaka et al. can be achieved without securing the bond wires to the supporting portions 15. Thus, it cannot be argued that Tanaka et al. implies securement when the exact opposite is clearly taught.

It should also be noted that there is no disclosure in the description of Figs. 8-11 of any effects of flowing resin. At Col 10, lines 43-46, Tanaka et al. indicates that the occurrence of a short-circuit among mutual wires can be reduced by maintaining the loop height of the wire constant. And while resin is mentioned at Col 10, lines 36-41, it is only as a constituent of the supporting portion 15.

It is thus apparent that the Examiner’s argument that “maintaining” implies some form of securement against flowing resin is conjecture, not supported by Tanaka et al., that is formed in hindsight on the basis of applicant’s claim language.

Because Tanaka et al. merely teaches the use of a supporting portion 15 that establishes a fixed (Col. 10, line 35) or constant (Col. 10, lines 43) height for the bonding wire, Tanaka et al. cannot anticipate claims 1 or 20 which require that the intermediate lead finger be coupled (claim 1A) or affixed (claim 20) to the intermediate portion of the lead wire and remain so connected during a subsequent molding process.

Likewise dependent claims 2-7 and 21-16 are not anticipated by Tanaka et al.

b. Dependent Claims 8 and 27 Are Not Obvious under 35 U.S.C. 103(a) in view of Tanaka et al.

To establish a prima facie case of obviousness, three basic criteria must be met:

- 1) there must be some suggestion or motivation in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings;
- 2) there must be a reasonable expectation of success; and
- 3) the prior art reference must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant’s disclosure. (In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)).

The Examiner has rejected dependent Claims 8 and 27 under 35 U.S.C. §103(a) as being unpatentable over Tanaka. Each of these claims specifies that the semiconductor die comprises a programmable logic device. Claim 8 is dependent on independent Claim 1, and Claim 27 is dependent on independent Claim 20. In the Examiner's view, it would be obvious to substitute a programmable logic device for the die of Tanaka et al. since programmable logic devices are well known. However, as shown above, Tanaka does not disclose all the limitations of independent Claims 1 and 20. Therefore dependent Claims 8 and 27 likewise are allowable under §103(a) over Tanaka et al.

c. Claims 9-13 Are Not Obvious under 35 U.S.C. 103 over Lacap in view of Tanaka et al.

The Examiner has rejected Claims 9-13 under 35 U.S.C. §103(a) as being unpatentable over Lacap in view of Tanaka et al. At page 6, paragraph 1, of the Advisory Action of July 25, 2003, the Examiner acknowledged that "Lacap fails to teach the attachment of an intermediate lead finger to an intermediate lead finger mounting substrate, wherein the intermediate lead finger is positioned between the package lead and the bond pad and attached to an intermediate portion of the bond wire." However, as pointed out above, Tanaka likewise fails to teach the attachment of an intermediate lead finger to an intermediate portion of the bond wire. Since neither Tanaka nor Lacap, either taken alone or in combination, discloses, teaches, or suggests all the limitations of independent Claim 9, Claim 9 is likewise allowable under 35 U.S.C. §103(a) over Lacap in view of Tanaka et al. . Further, Claims 10-13, which are dependent on independent Claim 9, are also allowable for at least the same reasons claim 9 is allowable.

(9) Appendix - Claims on Appeal

1. A semiconductor package, comprising:
 - a semiconductor die with a bond pad;
 - a package lead;
 - a bond wire comprising a first end portion coupled to the package lead, a second end portion coupled to the bond pad, and an intermediate portion; and

an intermediate lead finger positioned between the package lead and the bond pad, wherein the intermediate lead finger is coupled to the intermediate portion of the bond wire, and remains so coupled through a subsequent molding process.

2. The package of claim 1, further comprising an intermediate lead finger mounting substrate, wherein the intermediate lead finger is mounted on the intermediate lead finger mounting substrate.

3. The package of claim 2, wherein the intermediate lead finger and the intermediate lead finger mounting substrate are formed of a non-conducting material.

4. The package of claim 3, further comprising a die attachment pad attached to the intermediate lead finger mounting substrate.

5. The package of claim 4, wherein the die attachment pad is made of a heat-conducting material for rapid heat dissipation.

6. The package of claim 4, further comprising a mold compound that encloses the semiconductor die, a portion of the package lead, the bond wire, the intermediate lead finger, and the die attachment pad.

7. The package of claim 1, wherein the intermediate lead finger comprises a non-conducting portion for attaching to the intermediate portion of the bond wire.

8. The package of claim 1, wherein the semiconductor die comprises a programmable logic device.

9. A semiconductor package, comprising:
an intermediate lead finger mounting substrate having a first surface and a second surface;
a semiconductor die with a bond pad, the semiconductor die being attached on the first surface of the intermediate lead finger mounting substrate;

a package lead;

a bond wire comprising a first end portion coupled to the package lead, a second end portion coupled to the bond pad, and an intermediate portion;

an intermediate lead finger mounted on the first surface of the intermediate lead finger mounting substrate, wherein the intermediate lead finger is positioned between the package lead and the bond pad, and wherein the intermediate lead finger is attached to the intermediate portion of the bond wire, and remains so attached through a subsequent molding process;

a heat sink coupled to the second surface of the intermediate lead finger mounting substrate; and

a mold compound that encloses the semiconductor die, a portion of the package lead, the bond wire, the intermediate lead finger, and the heat sink.

10. The package of claim 9, wherein the intermediate lead finger and the intermediate lead finger mounting substrate are formed of a non-conducting material.

11. The package of claim 9, wherein the intermediate lead finger comprises a non-conducting portion for attaching to the intermediate portion of the bond wire.

12. The package of claim 9, wherein the semiconductor die comprises a programmable logic device.

13. The package of claim 9, wherein the semiconductor die is mounted on a center portion of the first surface of the intermediate lead finger mounting substrate, and wherein the intermediate lead finger is mounted on a peripheral portion of the first surface of the intermediate lead finger mounting substrate.

20. (Amended) A semiconductor package, comprising:
a semiconductor die with a bond pad;
a package lead;
a bond wire comprising a first end portion coupled to the package lead, a second end portion coupled to the bond pad, and an intermediate portion; and

an intermediate lead finger positioned between the package lead and the bond pad, the intermediate lead finger affixing at least part of the intermediate portion of the bond wire at a position between the semiconductor die and the package lead, and remains so affixed through a subsequent molding process.

21. The package of claim 20, further comprising an intermediate lead finger mounting substrate, wherein the intermediate lead finger is mounted on the intermediate lead finger mounting substrate.

22. The package of claim 21, wherein the intermediate lead finger and the intermediate lead finger mounting substrate are formed of a non conducting material.

23. The package of claim 22, further comprising a die attachment pad attached to the intermediate lead finger mounting substrate.

24. The package of claim 23, wherein the die attachment pad is made of a heat conducting material for rapid heat dissipation.

25. The package of claim 23, further comprising a mold compound that encloses the semiconductor die, a portion of the package lead, the bond wire, the intermediate lead finger, and the die attachment pad.

26. The package of claim 20, wherein the intermediate lead finger comprises a non conducting portion for attaching to the intermediate portion of the bond wire.

27. The package of claim 20, wherein the semiconductor die comprises a programmable logic device.

For the foregoing reasons, the claims on appeal are believed to be patentable and in condition for allowance. Such action is respectfully requested.

Respectfully Submitted,

Date: December 29, 2003



Brett Lovejoy for
Francis E. Morris
PENNIE & EDMONDS LLP
3300 Hillview Avenue
Palo Alto, CA 94304
(650) 493-4939

Reg. No. 42,813
Reg. No. 24,615



U.S. Patent Application Serial No.: 09/863,652

Express Mail No. EV 313 842 586 US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of: Cheach, Eng-Chew

Confirmation No.: 1049

Serial No.: 09/863,652

Art Unit: 2827

Filed: May 22, 2001

Examiner: David A. Zarneke

For: *Multi-Tiered Lead Package for an
Integrated Circuit*

Attorney Docket No: 009818-0050-999

**BRIEF ON APPEAL BEFORE THE BOARD OF PATENT APPEALS AND
INTERFERENCES**

Commissioner for Patents
Mail Stop AF
P. O. Box 1450
Alexandria, VA 22313-1450

Sirs:

(1) Real Party in Interest

The real party in interest is Altera Corporation

(2) Related Appeals and Interferences

There are no related appeals or interferences.

(3) Status of Claims

Claims 1-13 and 20-27 are pending and appealed. Claims 14-19 are directed to a non-elected invention and have been cancelled without prejudice.

(4) Status of Amendments

On June 27, 2003, a response was filed to a final rejection. An Advisory Action mailed on July 25, 2003, states that proposed amendments in that response will be entered for purposes of appeal.

(5) Summary of the Invention

As semiconductor die sizes have become smaller, bond pad pitches have become smaller, bond wire-lengths have become longer, and bond wire diameters have become smaller. As a result, the bond wires are relatively flexible and prone to contact each other to form short circuits.

To prevent this from happening, the present invention provides an intermediate lead finger to which an intermediate portion of a bond wire is coupled (as in independent claim 1), or attached (as in independent claim 9), or affixed (as in independent claim 20). This structure is shown in Fig. 1A where a bond wire 140 is connected at one end to a package lead 150 and at the other end to a bond pad 135 while an intermediate portion is attached to an intermediate lead finger 125a. (See Specification at 4, lines 15-18.)

This structure is confirmed by the process diagram of Fig. 2 and the description thereof on page 5 of the Specification. There it is stated that the bond wires are attached to the bond pads of the semiconductor die at step 230 (lines 8-9), the bond wires are attached to the package leads at step 240 (line 10), and the intermediate portions of the bond wires are attached to the intermediate bond (sic: should read, "lead") fingers at step 250 (lines 11-12). Further it is noted at lines 14-17, that the intermediate portions of the bond wires are immobilized during subsequent manufacturing procedures by the intermediate bond (sic: lead) fingers.

As a result of this arrangement, each of the bond wires is effectively divided into two shorter portions. (See Specification at 4, lines 19-20.) And, because of their shorter length, these portions have greater structural integrity and are less likely to create a short with an adjacent bond wire, e.g., when molding material is poured over the package.

(6) Issues

The following issues are presented:

- a. Are claims 1-7 and 20-26 anticipated under 35 U.S.C. 102(e) by Tanaka et al. (U.S.P. 6,265,762)?
- b. Are claims 8 and 27 obvious under 36 U.S.C. 103(a) in view of Tanaka et al.?
- c. Are claims 9-13 obvious under 35 U.S.C., 103(a) over Lacap (U.S.P. 5,905,299) in view of Tanaka et al.?

(7) Grouping of Claims

No further grouping of claims is proposed.

(8) Argument

This appeal is narrowly focused on what is taught in Figs. 8-11 of Tanaka et al. Figs. 8 and 9 are sectional views of one embodiment and Figs. 10 and 11 are sectional views of a variation of the first embodiment. Figs. 8-11 are described at Col. 10, lines 23-67 of Tanaka et al.

Each of Figs. 8-11 shows a wire supporting portion 15. As shown in Figs. 9 and 11, a bonding wire 13 extends upward from a pad electrode 11 on a semiconductor chip 10, is bent downwards approximately 120°, appears to touch a corner of supporting portion 15, and ends at lead 4. Elements 10, 11 and 15 are not explicitly referred to by number in the description of Figs. 8-11 but they are referred to in the description of Fig. 4 at Col. 5, line 66 to Col. 6, line 1. At Col. 10, lines 31- 36, the description of Fig. 8 states that the wire supporting portion 15 “is capable of supporting and maintaining a loop of wire bonded between the pad electrodes of the semiconductor chip and respective leads at a fixed height when the semiconductor device is assembled.” The Tanaka et al. specification goes on to state at Col. 10, lines 43-46 that “it is possible to maintain the loop height of the wire constant because a wire supporting portion 15 for supporting the bonding wire is provided. Thus, the possible occurrence of a short-circuit among mutual wires can be reduced.”

The difference between the variation of Figs. 10 and 11 and the embodiment of Figs. 8 and 9 lies in the mounting of supporting portion 15 on a jig 16 in the variation of Figs. 10 and 11. In the variation, the supporting portions 15 project through slits 17 in supporting body 8; and, as stated at Col. 10, lines 60-61 the supporting portions are retracted from the slits after wire bonding is completed. Since the supporting portions are retracted from the slits after wire bonding is completed, it is apparent that the bonding wires are not affixed or bonded in any way to the supporting portions and that the function of the supporting portions has been accomplished once the wire bonding is completed. As is made clear at Col. 10, line 35 and again at line 43, the function of the supporting portions 15 of Tanaka et al. is to maintain the bonding wires at a fixed or constant height.

a. Claims 1-7 and 20-26 are not anticipated under 35 U.S.C. 102(e)
by Tanaka et al.

To establish anticipation, each element of the claim must be disclosed in a single reference.

Applicant's independent claims 1 and 20 are directed to a semiconductor package having a semiconductor die with a bond pad, a package lead, a bond wire coupled at one end to the package lead and at the other end to the bond pad, and an intermediate lead finger. The intermediate lead finger is positioned between the package lead and the bond pad and is coupled (as in claim 1) or affixed (as in claim 20) to an intermediate portion of the bond wire. Further, the intermediate lead finger remains so coupled or affixed through a subsequent molding process.

Tanaka et al. does not describe a semiconductor package in which the bonding wire is coupled or affixed to an intermediate lead finger. Tanaka et al. clearly states at Col 10, lines 33-35 that the bonding wire is "bonded between the pad electrodes of the semiconductor chip and respective leads," conspicuously omitting any mention of any connection to the supporting portion 15. Moreover, the supporting portion 15 in the variation of Figs. 10 and 11 can be withdrawn from slits 17 after wire bonding is complete. If the bonding wires were connected to the supporting portions, withdrawal of portions 15 would also draw the bonding wires through the slits and thereby destroy the electrical connection between the bonding pads and the leads. Since such destruction is obviously not desired, it is clear that the supporting portions 15 are not connected to the bonding wires.

The Examiner concedes in the Advisory Action of July 25, 2003, that there is no explicit teaching in Tanaka of a connection between the supporting portions 15 and the bonding wires because he points to no such teaching. Instead, the Examiner argues that Tanaka's use of the word "maintaining" at Col 10, line 33 "does indeed *imply* some form of securement." (Emphasis supplied) Applicant respectfully disagrees with what in essence is an argument from inherency.

The Examiner relies on dictionary definitions that "maintaining" means "to keep in an existing state" and "to defend or hold against criticism or attack" and argues that these can be interpreted to "include the concept of 'maintaining' against the flow of a molding resin." In making this argument, however, the Examiner overlooks both the clear statements in Tanaka et al. as to what is being supported and maintained and the absence of any discussion of the effects of flowing resin. At Col. 10, lines 33-35, Tanaka et al. clearly states that the supporting portion "is capable of supporting and maintaining a loop of wire . . . at a fixed height. This usage of the word "maintaining" has nothing to do with defending against criticism or attack. Moreover, in view of the statement at Col 10, lines 60-61 that the

supporting portions are retracted from slits 17 after wire bonding is completed, it appears that “maintaining” as used in Tanaka et al. does not even have the meaning of “keep in an existing state.”

Most importantly, the fact that the supporting portions 15 are clearly not connected to the bonding wires in the variation of Figs. 10 and 11, but do achieve the function of stabilizing bonding (Col. 10, line 65) makes it apparent that the goals of Tanaka et al. can be achieved without securing the bond wires to the supporting portions 15. Thus, it cannot be argued that Tanaka et al. implies securement when the exact opposite is clearly taught.

It should also be noted that there is no disclosure in the description of Figs. 8-11 of any effects of flowing resin. At Col 10, lines 43-46, Tanaka et al. indicates that the occurrence of a short-circuit among mutual wires can be reduced by maintaining the loop height of the wire constant. And while resin is mentioned at Col 10, lines 36-41, it is only as a constituent of the supporting portion 15.

It is thus apparent that the Examiner’s argument that “maintaining” implies some form of securement against flowing resin is conjecture, not supported by Tanaka et al., that is formed in hindsight on the basis of applicant’s claim language.

Because Tanaka et al. merely teaches the use of a supporting portion 15 that establishes a fixed (Col. 10, line 35) or constant (Col. 10, lines 43) height for the bonding wire, Tanaka et al. cannot anticipate claims 1 or 20 which require that the intermediate lead finger be coupled (claim 1A) or affixed (claim 20) to the intermediate portion of the lead wire and remain so connected during a subsequent molding process.

Likewise dependent claims 2-7 and 21-16 are not anticipated by Tanaka et al.

b. Dependent Claims 8 and 27 Are Not Obvious under 35 U.S.C. 103(a) in view of Tanaka et al.

To establish a prima facie case of obviousness, three basic criteria must be met:

- 1) there must be some suggestion or motivation in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings;
- 2) there must be a reasonable expectation of success; and
- 3) the prior art reference must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant’s disclosure. (In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)).

The Examiner has rejected dependent Claims 8 and 27 under 35 U.S.C. §103(a) as being unpatentable over Tanaka. Each of these claims specifies that the semiconductor die comprises a programmable logic device. Claim 8 is dependent on independent Claim 1, and Claim 27 is dependent on independent Claim 20. In the Examiner's view, it would be obvious to substitute a programmable logic device for the die of Tanaka et al. since programmable logic devices are well known. However, as shown above, Tanaka does not disclose all the limitations of independent Claims 1 and 20. Therefore dependent Claims 8 and 27 likewise are allowable under §103(a) over Tanaka et al.

c. Claims 9-13 Are Not Obvious under 35 U.S.C. 103 over Lacap in view of Tanaka et al.

The Examiner has rejected Claims 9-13 under 35 U.S.C. §103(a) as being unpatentable over Lacap in view of Tanaka et al. At page 6, paragraph 1, of the Advisory Action of July 25, 2003, the Examiner acknowledged that "Lacap fails to teach the attachment of an intermediate lead finger to an intermediate lead finger mounting substrate, wherein the intermediate lead finger is positioned between the package lead and the bond pad and attached to an intermediate portion of the bond wire." However, as pointed out above, Tanaka likewise fails to teach the attachment of an intermediate lead finger to an intermediate portion of the bond wire. Since neither Tanaka nor Lacap, either taken alone or in combination, discloses, teaches, or suggests all the limitations of independent Claim 9, Claim 9 is likewise allowable under 35 U.S.C. §103(a) over Lacap in view of Tanaka et al. . Further, Claims 10-13, which are dependent on independent Claim 9, are also allowable for at least the same reasons claim 9 is allowable.

(9) Appendix - Claims on Appeal

1. A semiconductor package, comprising:
 - a semiconductor die with a bond pad;
 - a package lead;
 - a bond wire comprising a first end portion coupled to the package lead, a second end portion coupled to the bond pad, and an intermediate portion; and

an intermediate lead finger positioned between the package lead and the bond pad, wherein the intermediate lead finger is coupled to the intermediate portion of the bond wire, and remains so coupled through a subsequent molding process.

2. The package of claim 1, further comprising an intermediate lead finger mounting substrate, wherein the intermediate lead finger is mounted on the intermediate lead finger mounting substrate.

3. The package of claim 2, wherein the intermediate lead finger and the intermediate lead finger mounting substrate are formed of a non-conducting material.

4. The package of claim 3, further comprising a die attachment pad attached to the intermediate lead finger mounting substrate.

5. The package of claim 4, wherein the die attachment pad is made of a heat-conducting material for rapid heat dissipation.

6. The package of claim 4, further comprising a mold compound that encloses the semiconductor die, a portion of the package lead, the bond wire, the intermediate lead finger, and the die attachment pad.

7. The package of claim 1, wherein the intermediate lead finger comprises a non-conducting portion for attaching to the intermediate portion of the bond wire.

8. The package of claim 1, wherein the semiconductor die comprises a programmable logic device.

9. A semiconductor package, comprising:
an intermediate lead finger mounting substrate having a first surface and a second surface;
a semiconductor die with a bond pad, the semiconductor die being attached on the first surface of the intermediate lead finger mounting substrate;

a package lead;

a bond wire comprising a first end portion coupled to the package lead, a second end portion coupled to the bond pad, and an intermediate portion;

an intermediate lead finger mounted on the first surface of the intermediate lead finger mounting substrate, wherein the intermediate lead finger is positioned between the package lead and the bond pad, and wherein the intermediate lead finger is attached to the intermediate portion of the bond wire, and remains so attached through a subsequent molding process;

a heat sink coupled to the second surface of the intermediate lead finger mounting substrate; and

a mold compound that encloses the semiconductor die, a portion of the package lead, the bond wire, the intermediate lead finger, and the heat sink.

10. The package of claim 9, wherein the intermediate lead finger and the intermediate lead finger mounting substrate are formed of a non-conducting material.

11. The package of claim 9, wherein the intermediate lead finger comprises a non-conducting portion for attaching to the intermediate portion of the bond wire.

12. The package of claim 9, wherein the semiconductor die comprises a programmable logic device.

13. The package of claim 9, wherein the semiconductor die is mounted on a center portion of the first surface of the intermediate lead finger mounting substrate, and wherein the intermediate lead finger is mounted on a peripheral portion of the first surface of the intermediate lead finger mounting substrate.

20. (Amended) A semiconductor package, comprising:
a semiconductor die with a bond pad;
a package lead;
a bond wire comprising a first end portion coupled to the package lead, a second end portion coupled to the bond pad, and an intermediate portion; and

an intermediate lead finger positioned between the package lead and the bond pad, the intermediate lead finger affixing at least part of the intermediate portion of the bond wire at a position between the semiconductor die and the package lead, and remains so affixed through a subsequent molding process.

21. The package of claim 20, further comprising an intermediate lead finger mounting substrate, wherein the intermediate lead finger is mounted on the intermediate lead finger mounting substrate.

22. The package of claim 21, wherein the intermediate lead finger and the intermediate lead finger mounting substrate are formed of a non conducting material.

23. The package of claim 22, further comprising a die attachment pad attached to the intermediate lead finger mounting substrate.

24. The package of claim 23, wherein the die attachment pad is made of a heat conducting material for rapid heat dissipation.

25. The package of claim 23, further comprising a mold compound that encloses the semiconductor die, a portion of the package lead, the bond wire, the intermediate lead finger, and the die attachment pad.

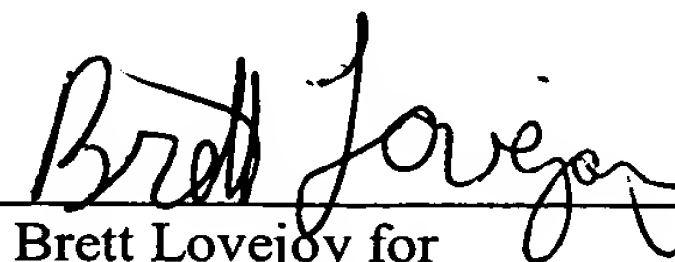
26. The package of claim 20, wherein the intermediate lead finger comprises a non conducting portion for attaching to the intermediate portion of the bond wire.

27. The package of claim 20, wherein the semiconductor die comprises a programmable logic device.

For the foregoing reasons, the claims on appeal are believed to be patentable and in condition for allowance. Such action is respectfully requested.

Respectfully Submitted,

Date: December 29, 2003



Brett Lovejoy for
Francis E. Morris
PENNIE & EDMONDS LLP
3300 Hillview Avenue
Palo Alto, CA 94304
(650) 493-4939

Reg. No. 42,813
Reg. No. 24,615